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ILLING TESTS OF WHEAT.—NEW VARIETIES OF CEREALS

EVIDENCE

OF

DR. CHARLES E. SAUNDERS
EXPERIMENTALIST, DOMINION EXPERIMENTAL FARMS.

BEFORE THE

SELECT STANDING COMMITTEE

ON

AGRICULTURE AND COLONIZATION

1905

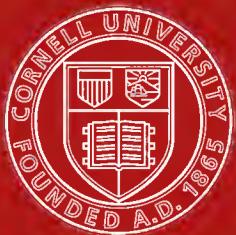
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MILLING TESTS OF WHEAT.—NEW VARIETIES

HOUSE OF COMMONS,
COMMITTEE ROOM 34,
TUESDAY, March 21, 1905.

The Select Standing Committee on Agriculture and Colonization met here this day at 10 o'clock am., Mr. Greenway, Chairman, presiding.

THE CHAIRMAN.—We shall hear this morning from Dr. Charles E. Saunders, Experimentalist at the Central Experimental Farm.

EXPERIMENTAL FLOUR MILL.

DR. SAUNDERS.—Mr. Chairman and Gentlemen, last year when I appeared before this Committee, I made some reference to the fact that an experimental flour mill was being purchased for the study of the different varieties of wheat, and also for the study of wheat in different conditions of plumpness, hardness, &c. This morning I purpose to bring before you, first of all, some of the results of the work which has been done with the aid of the new mill. The apparatus really includes two small mills, one having a pair of corrugated rollers and the other a smooth pair. Large commercial mills are generally equipped with several kinds of rollers, but two pairs are sufficient for most experimental purposes. The machine is provided also with a sifting apparatus and a set of 12 sieves, running from No. 16 wire gauze (with meshes of about one-sixteenth of an inch) up to No. 14 silk (which has approximately 140 meshes to the running inch). The mill, of course, is adapted to the use of very small quantities of wheat, because, as you will readily understand, it is frequently necessary to reach a decision as to the quality of a wheat before we have any large quantity of it on hand, and in many cases we are saved much time and trouble by the use of a mill of this kind, as we are able to eliminate varieties of poor quality without waiting for the accumulation of a large amount of grain before making a test.

The quantities that we use are about the same as those employed in other laboratories where experimental milling is carried on five pounds or less of grain being sufficient. Indeed, our mill enables us to make quite satisfactory tests with as little as one or two pounds of wheat. We usually make what is called 'straight' flour, a term which includes all the flour of reasonably good quality that can be obtained from the wheat. It is possible also to make 'patent' flour with this small mill, but that is more difficult, and is not necessary, as a rule. I might explain, however, to those who are not familiar with milling, that it is quite impossible in an experimental flour mill, whether it be small or large, to make flour of the very finest colour. Everyone will easily understand that when accurate quantitative results are required it is necessary to run all the materials through to the end in each operation, to stop the machinery repeatedly, and to thoroughly brush out the inside of the mills and of the sifting apparatus. Under such circumstances no miller would expect the flour produced to be of the best colour. This, however, does not interfere at all with the accuracy of the results, because all our samples are treated alike and are judged by their relative rather than their absolute colour. The flour produced in the mill is carefully studied by mechanical and chemical methods. The chemical work, such as the determination of

nitrogen, fat, &c., is done in the chemical laboratory. In my division the quantity of gluten is determined, and the quality also as far as it can be decided by empirical methods. The colour and the water-absorbing power of the flours are also studied.

The most important test, however, is in the making of bread where both the quality and quantity of the gluten combine to give the results. The quantity of flour required for a baking test is not large, but the work must of course be done with considerable care if trustworthy conclusions are to be reached.

I have a small fermenting cupboard which is kept at a temperature of about thirty-four degrees centigrade, and a small gas oven which is easily regulated to the desired temperature for baking (about two hundred and ten degrees centigrade). By keeping the conditions as nearly uniform as possible, one batch of bread can be compared with another fairly well; but when very accurate comparisons are wanted, the flours which are being compared are always put through in the same batch. Six different kinds of flour can be fermented and baked together.

Two rather distinct investigations are being carried on at the present time. The object of the first is to determine the relative value for milling purposes of all the varieties of wheat grown in Canada; good samples being, of course, used in all cases. It may not be generally known that some very poor kinds of wheat are grown in eastern Canada and also, occasionally, on the western prairies; though in the latter districts there is a decided preponderance of Red Fife which keeps up the average quality of the whole crop. In eastern Canada poorer varieties have the ascendancy; and I am convinced that the relatively low price of eastern wheat is not due primarily to any defect of climate or of soil, but rather to lack of care in the choice of the varieties used for seed. When first-class varieties, such as Red Fife or White Fife are grown in eastern Canada, the crop obtained in an average season is of very high value for milling purposes. Ordinary commercial samples of eastern spring wheat are, however, usually of inferior quality. Much the same condition exists in regard to winter wheat, that is to say, the varieties of winter wheat have not been selected for their suitability for bread-making purposes and the average quality of the winter wheat grown in Ontario is by no means as good as it should be.

RED FIFE COMPARED WITH WHITE FIFE.

I wish to present to you two cases which serve to demonstrate the practical value of experimental milling and baking tests. One of the questions which we are sometimes asked is as to the relative value of Red and White Fife for milling purposes. In order to make a comparative test, it was necessary to obtain both varieties in pure condition, and grown in the same field in the same season. For this purpose we took samples from our own uniform test plots. In this way we were able to be sure of the uniformity of the conditions under which the varieties were grown and also of their purity. Commercial Red Fife is often somewhat impure and commercial White Fife is usually strikingly so. The samples of the two varieties taken from our own plots were carefully ground, the process of milling being the same in both cases, and the two samples of flour were then carefully analyzed and baked. The two flours were of the same colour, yielded about identical amounts of gluten, absorbed the same quantity of water in making dough, and gave loaves of the same volume, colour and texture. (Samples of flour and bread were shown).

It is clear that the flour from White Fife is equal in value that made from Red Fife. In fact, the two are practically indistinguishable.

So far as yield and earliness are concerned, Red Fife and White Fife are also almost identical.

By the Chairman:

Q. Are those Ontario samples of wheat?

A. They were both grown on the Experimental Farm at Ottawa in 1902. That

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was an exceptionally good year, and we have saved several samples from that crop for study.

Q. You have made no tests of western wheat?

A. I have tested western grown Red Fife, but not White Fife.

I may say that this investigation was only commenced last autumn, and has, therefore, not yet progressed very far. The milling and baking test is the most accurate test we have found for the comparison of varieties. In some cases one finds a difference in this way between varieties which in other respects appear identical. There is practically no difference between Red and White Fife, except that White Fife has a yellow skin and Red Fife has a red skin. However, the red skin is fashionable just now. There is undoubtedly a prejudice, sometimes a strong one, against yellow skin.

By Mr. Burrows:

Q. You say that White Fife is equally productive?

A. Yes.

By the Chairman:

Q. Not more productive?

A. I think not, as a rule. It varies in different localities, but taking the average on the experimental farms there has not been any great difference in productiveness.

Q. We think it more productive in the west, at least I do?

A. On some soils it may be more productive.

THE MILLING VALUE OF CLUB WHEAT.

We have had inquiries from northern Manitoba in regard to the milling value of a variety of wheat which goes by the name of Club, which has a small, thickened head with red chaff. The wheat itself is very fine looking and attractive when well matured. Compared with Red Fife, as grown at Indian Head last season, the Club wheat from northern Manitoba can scarcely be said to be inferior in appearance. Both samples are excellent. (Samples shown).

By Mr. Burrows:

Q. From what part of northern Manitoba?

A. The district of Gilbert Plains.

Q. They call it Kidd wheat out there, from the man who brought it into that district?

A. The sample of Club wheat sent to us was ground this winter and the flour was analyzed. It was found to be somewhat deficient in quantity of gluten. The gluten is also lacking in strength. The colour of the flour is a dark, unattractive yellow.

Q. They claim out there that Club wheat is an early variety and matures four or five days earlier than Red Fife?

A. That is no doubt quite correct. I wish to call particular attention to the two samples of wheat, because of the fine appearance of the Club wheat, even when compared with the best Red Fife. The flour from Club wheat shows its inferiority to a certain extent on analysis, as I have just pointed out. But the baking test shows that it is of very poor quality; and I should, therefore, strongly advise the farmers of northern Manitoba to discontinue the cultivation of this wheat.

By Mr. Bland:

Q. Does the Red Fife grown in Ontario or Quebec give as good results as the No. 1 Hard in Manitoba and the west?

A. That is a question to which I am scarcely prepared to give a decided answer

at present; but so far as the investigations have gone they do not show any inferiority in the quality of patent flour made from the Red Fife grown in eastern Canada. It is unlikely, however, that comparatively soft Red Fife will yield as large a percentage of patent flour as would be obtained from No. 1 Hard.

The bread made from Club wheat is singularly unattractive, being heavy and very dark in colour, and when compared with Red Fife it is strikingly inferior. These loaves (specimens shown) were baked yesterday under exactly the same conditions, the same amounts of yeast having been used and the dough having received exactly the same treatment in both cases. While it might be possible by varying the conditions to produce better bread than this from Club wheat, its quality would in any case be very poor. This bread was made from that attractive sample of Club wheat which I showed to you this morning, and I wish in this connection to emphasize the fact that it is quite impossible for anyone to tell good wheat by merely looking at it.

Q. That gives a flour somewhat like Goose wheat?

A. The flour from Goose wheat is not so dark as this.

By an Hon. Member:

Q. Could not the dark colour be accounted for by the method of milling?

A. No, sir. All the varieties of flour which I have here (ten in number) were produced in the same mill and by essentially the same method. Yet the others are not dark like the Club. The Club was ground twice with the same result.

By Mr. Burrows:

Q. Do you remember who sent that wheat to you?

A. Mr. George Dow, of Gilbert Plains, Manitoba.

Mr. BURROWS.—I know the district it was grown in, and the people out there think it is a wheat of very good quality.

The CHAIRMAN.—It certainly looks good. I do not know whether you can see any difference when you compare it with this sample of Red Fife.

By Mr. Jackson (Selkirk):

Q. By stone-grinding you might get a pure flour?

A. I do not think that stone-grinding would improve its appearance.

Q. It makes very sweet bread, although not very light?

A. Of course the stone-grinding is out of fashion and one has to consider the fashions very much in these matters.

THE BLEACHING OF FLOUR.

The question of colour of course cannot be dismissed without the consideration of bleaching. As you are probably aware, one, at least, of the very large milling companies in Canada, now bleaches its first grade flour. It is true that a rival company announces that by the use of first-class wheat the necessity for bleaching is avoided. It remains to be seen whether the public will prefer the bleached flour with its pale cream tint or the unbleached with its rather deep cream colour. The flour in both cases is made from Manitoba and other prairie wheat. I have samples of flour and bread to show how the colour of the flour from Club wheat is changed by bleaching. The process I use in the laboratory for bleaching flour is not identical with that which is used in the large mills, but it gives results which are similar so far as colour is concerned.

By Mr. Finlay:

Q. How is it bleached?

A. In the laboratory it is most convenient to use oxides of nitrogen generated by the decomposition of nitric acid; but in large mills the most popular method is to

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use the mixture of gasses produced by passing electric sparks through air. You will see from these samples that the bleached flour is somewhat more attractive in appearance and makes rather more attractive looking bread; but the bleaching does not remedy the defects of the gluten, and the bread from the bleached flour is heavy, like the other.

By Mr. Jackson:

Q. How about the value of this flour for food?

A. It is fairly nutritive flour, but its commercial value depends of course on its attractiveness to the public, and it certainly appears from these samples that bread made from pure Club wheat would be almost unsaleable. If the flour were mixed with a sufficient quantity of Red Fife, it could of course be easily marketed, but in pure condition it would command only an extremely low price, I think.

By Mr. Miller:

Q. Does bleaching render the flour less wholesome?

A. Bleached flour is believed to be quite as wholesome, provided the treatment has not been very severe. The subject, however, needs further investigation.

By Mr. Burrows:

Q. What effect would altitude have upon the growth of that Club wheat?

A. It might have a favourable effect. The sample of Red Fife with which I have been comparing it was not grown in the same district, but is similar in appearance and quite comparable with it. Even the earliness of the Club wheat is not a sufficient reason for retaining it, because we have other varieties, such as Stanley and Preston, for instance, which are very distinctly superior to Club wheat for milling purposes, and which I believe are quite as early, and will probably give a larger crop. The Club wheat does very poorly here at Ottawa.

By Mr. Cochrane:

Q. It is particularly liable to rust, is it not?

A. It is extremely subject to rust here. Possibly in a drier climate it might not rust badly.

COLOUR OF FLOUR.

While on the subject of the colour of flour, I should like to call your attention to the fact that Red Fife does not give white flour. It is sometimes maintained that one of the strong points about Red Fife wheat is that it gives white flour. As a matter of fact, some inferior varieties give a colour nearer to white, flour from Red Fife wheat being always cream-coloured. I should rather say of Red Fife that it gives the palest flour of any strong wheat. The flour obtained from White Russian is much nearer to white, but is distinctly inferior in strength. Very soft winter wheats, such, for instance, as this sample of the variety called Arcadia, yield flour almost pure white in colour, but poor for bread making. These instances serve to show that the paler flours are not necessarily the best. Indeed one cannot judge flour by its appearance any more than one can wheat. This white flour from soft winter wheat would probably prove admirable for biscuits and pastry, but is not a success for bread-making, as this loaf of heavy bread proves. (Sample shown). The bread has what may be described as a dead white colour which is, to most people, less attractive than the cream colour when Red Fife flour is used.

By Mr. Herron:

Q. Where was that winter wheat grown?

A. At Burlington, Ontario. If you compare that loaf of bread with the bread made from White Russian spring wheat grown here at Ottawa, you will see that the

White Russian gives a larger, less heavy loaf, though the colour is similar. The other strong, or moderately strong, wheats that we have nearly all give flour of a deeper cream colour than Red Fife, the colour in some cases being quite a decided yellow. I have samples here of flour made from Stanley and from Preston wheat which, as some of you are no doubt aware, are crosses between Red Fife and Ladoga. These are fairly strong flours, both a little darker in colour than the Red Fife. I have also a sample of flour made from Ladoga. Ladoga was one of the first early wheats brought into the country after the establishment of the experimental farms; it was grown for some time until it was found that the flour made from it was rather too dark in colour to suit the public taste. Now, I believe, it is not grown largely in any district, except on the Peace river, in the neighbourhood of Fort Vermilion, where it is said to be the sole source of supply for the Fort Vermilion mill. The Ladoga makes a very fair loaf of bread, though the yellow tint is rather pronounced. Of course, compared with the Red Fife, there is quite a difference. At the same time, the yellowness is not altogether unattractive to many people. It is not a deep yellow like that which Club wheat gives. I have also here, for comparison, small loaves made from some of the cross-bread wheats, which are now being introduced by the experimental farm, Preston, Stanley and Early Riga. They give very good bread, but not quite equal in colour to Red Fife.

By Mr. Thompson:

Q. What is the name of the variety that they grow in the Peace River country?

A. The Ladoga.

Q. They get the best results from that?

A. I think it is the only early variety which they have tested thoroughly. We have sent other early varieties to them from which we think perhaps they will get better results. Varieties as late as Red Fife cannot be depended on to ripen there. This is perhaps all I need say on the subject of milling tests of the different varieties of wheat.

THE MILLING VALUE OF THE DIFFERENT GRADES OF WHEAT.

By the Chairman:

Q. Do you know anything of the tests that were made by the Agricultural Department in the North-west?

A. Those were tests of the different grades of wheat, not of different varieties. We are now making a somewhat similar series of tests at the experimental farm. Some months ago a request was received from the Manitoba Grain Growers' Association that we should undertake an investigation into the relative value of the different grades of wheat for milling purposes. Of course our investigation into the relative value of the different varieties of wheat is carried on with good samples only; but in studying the different grades we are concerned with mixtures varying in their plumpness, hardness, &c. So that the two investigations are quite distinct in character.

By Mr. Jackson (Selkirk):

Q. Can you tell us the amount of water absorbed by these different kinds of flour, when made into bread?

A. They absorb about 60 per cent of water when made into dough; and when baked thoroughly the bread retains about two-thirds of this added water. That is to say, 100 lbs. of flour will make about 160 lbs. of dough and about 140 lbs. of bread.

Q. Are they all alike in this respect?

A. Not identical, though among good varieties the differences are slight.

Q. Which variety of wheat takes up the higher percentage of water?

A. I think the Red Fife absorbs more water than any other variety we have yet tested, but the tests are quite incomplete at present. The amount of water absorbed

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in making dough, and the amount retained in the bread vary very much according to the methods of different bakers. In some cases the quantity of water retained is very large, but the bread is then usually too moist and insufficiently baked.

This request from the Grain Growers' Association was approved by the Minister and the investigation was commenced some weeks ago. It has not yet been carried very far, but some of the results obtained may be of interest to you. We obtained from Mr. Horn, the chief inspector at Winnipeg, mixed samples of each grade of wheat (except extra No. 1 Hard). The grades represented were:—No. 1 Manitoba Hard, Nos. 1, 2 and 3 Manitoba Northern, No. 4 Extra, No. 4, No. 5, Feed, and No. 2 Feed. In addition to these we obtained also a sample of No. 5 Frosted, making 10 samples in all. Each of these was thoroughly mixed, representing a large number of different shipments of grain. We thought it better to study such mixed samples, as they would be thoroughly representative, rather than to trust to special samples from individual farmers. The grain was cleaned for us, in Mr. Horn's office, to bring it up to the standard of the grain as it leaves Fort William. Further cleaning seemed desirable before milling. The loss from this cleaning increased gradually from one-fifth of one per cent in the case of No. 1 Hard to two per cent in the case of No. 2 Feed. The percentages of flour obtained from the different samples show a fairly regular decrease from 71 in No. 1 Hard to 49 in No. 2 Feed. But the total amount of flour obtained does not give an accurate idea of the relative value of the different grades. The quality of the flour must also be considered. No. 1 Hard gave 65 per cent of flour of fair quality and 6 per cent of low grade flour; while No. 2 Feed gave 22 per cent of flour of fair quality and 27 per cent of low grade flour. The other grades form a fairly regular series between these two extremes. It is unlikely that the lowest grades of wheat will give any flour at all that will be quite equal to the best product from the highest grades.

At the same time the lowest grades do contain a certain amount of serviceable flour. It does not follow, however, that it would pay any miller to buy such wheats at any reasonable price, because the expense of milling would be much greater for each barrel of flour than when good wheat was used. The percentages of bran and shorts increase as we go down the grades. There is only one other point which should perhaps be mentioned in this connection, namely, that No. 5 Frosted, seems to be of about the same value as the regular No. 5. This is perhaps all that I should say on this subject, as the investigation is not yet completed.

By Mr. C. Shaffner:

Q. Will you be able to tell us what each grade is worth for flour?

A. When the investigation is finished I hope to be able to reach conclusions as to the relative values of the different grades for milling purposes.

Q. You say that the samples you are analysing are mixed?

A. Yes, the samples were obtained from many different shipments of wheat, a small quantity from each. But, of course, each sample contains wheat of only one grade.

By Mr. Jackson (Selkirk):

Q. Did I understand you to say you could make good flour from frosted wheat?

A. Good flour can certainly be made from some samples of frosted wheat.

Q. No. 1 frosted, for instance?

A. Yes, I do not think there would be any difficulty if the wheat was almost ripe when frozen.

Q. Our experience with flour made in the country mills is that we cannot make proper bread with flour made from frozen wheat?

A. No doubt many samples of frozen wheat would yield flour of inferior quality.

By Senator Young:

Q. You say you obtained the samples from Inspector Horn?

A. Yes.

Q. You got average samples from each grade?

A. Yes.

Q. That would be the average of the bins in Fort William?

A. Yes, after the Fort William cleaning.

Q. He screened the grain before sending it to you?

A. Yes.

Q. You understand that the average in the bins is above the minimum of the grades?

A. Yes, sir.

NEW VARIETIES OF EARLY-RIPENING WHEATS.

Ever since the experimental farms were established efforts have been made to obtain, from other countries, desirable varieties of early-maturing wheat. The Ladoga wheat was one of the first of the sorts introduced with a view to extend the wheat area northward on the western prairies. This experiment was to a certain extent successful, and Ladoga wheat is now an important variety in some northern localities. We are still continuing this kind of work, however, and I wish to call your attention to one or two rather interesting varieties which we have obtained lately. We had last season a new variety from Hungary under the name of Hungarian White, which is quite promising.

By Mr. Schaffner:

Q. A bearded wheat?

A. Yes.

Q. A spring wheat?

A. It is a spring wheat. It is somewhat earlier than Red Fife, perhaps six days in an average season, and has rather a long, red kernel, gives flour of good quality, and altogether is promising for cultivation in some of our northern districts. We have made arrangements to test this wheat at all the experimental farms during the coming season, and we shall be able after that, and after the milling tests are completed, to speak more definitely in regard to it. Of course, all the new varieties we obtain are now subjected to a milling and baking test before they are sent out to farmers. We have also obtained from central Ontario a bearded wheat which is very promising for quality, and which is said to be extremely early. It was sent to us by a farmer who selected it out of a field of mixed wheat. It is probably of Russian origin. It is very much like some of the Russian varieties we have (especially the Ladoga), but is, perhaps, superior to any of them. It is called Burkinshaw's Early. We have also obtained from Australia some new varieties, of which the most interesting is one known as Bobs, which is said to be almost perfectly resistant to rust. The claim that a variety resists rust is so commonly made that we always receive it with a certain amount of scepticism. At the same time the growth of this new wheat will be watched with great interest.

THE ORIGIN OF RED FIFE WHEAT.

Among the varieties obtained from Europe last season it was very interesting to find Red Fife, under another name of course. Indeed, we received two or three samples of wheat, under different names, which very closely resemble Red Fife, but absolute identity has been established in only one case thus far. The account of the origin of Red Fife wheat as given in the Canadian Agriculturist for 1861, is well known, but

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should perhaps be quoted again in this connection: 'About the year 1842, Mr. David Fife, of the Township of Otonabee, Canada West, now Ontario, procured through a friend in Glasgow, Scotland, a quantity of wheat which had been obtained from a cargo direct from Dantzig. As it came to hand just before spring seed time, and not knowing whether it was a fall or spring variety, Mr. Fife concluded to sow part of it that spring, and wait for the result. It proved to be a fall wheat, as it never ripened, except three ears, which grew apparently from a single grain. These were preserved, and although sown the next year under very unfavourable circumstances, being quite late, and in a shady place, it proved at harvest to be entirely free from rust, when all the wheat in the neighbourhood was badly rusted. The produce of this was carefully preserved, and from it sprang the variety of wheat known over Canada and the Northern States by the different names of Fife, Scotch and Glasgow.'

This account has given rise to the idea that Red Fife is a Canadian wheat, that it originated with Mr. Fife, in some wholly unaccountable manner or as a sport from some European variety. It always seemed to me probable that the kernel which Mr. Fife obtained was merely a seed of some common European variety which had found its way into this wheat from Dantzig. Last season, among our newly-imported European varieties, was one under the name of 'Galician,' obtained from a seedsman in Germany. Now, Galicia lies about 300 miles inland from Dantzig. This imported Galician wheat struck me at once as being very much like Red Fife, and I therefore sowed it last spring alongside Red Fife, and watched them both very carefully throughout the season. They proved to be identical at all stages of their growth as well as when the grain was harvested. A larger plot of Galician wheat furnished grain for milling purposes. This was ground, analyzed and baked. Red Fife from a plot in the same field was similarly treated. The two samples of flour were found to be alike in all respects and thus the absolute identity of the two wheats was established. The firm from which the seed of the Galician wheat was obtained informed me that the variety was procured by them many years ago from a farmer in Galicia. It seems, therefore, quite clear that the kernel of wheat which came into the hands of Mr. Fife, was a kernel of this Galician spring wheat, accidentally present in the cargo of winter wheat from Dantzig, of which he obtained a portion. It is interesting to be able to throw this light on the subject of the origin of Red Fife, which has hitherto seemed very dark. There is no doubt that this variety is still grown in Europe, and so far as our tests have gone, it seems to be of the same quality there as it is here.

IMPROVING WHEAT BY CROSSING AND SELECTION.

Besides improving wheat, we have of course endeavoured to improve our varieties, by crossing and selection, and this work has given rise to a number of new sorts. I have referred already to the introduction of Ladoga wheat, and to the crosses which were made between that variety and Red and White Fife, the object being to combine, as far as possible, the quality of the Fife wheats with the earliness of the Ladoga. Among these cross-bred sorts Preston, Stanley, Huron, and Percy are attracting most attention, and I have here samples of the flour of two or three of these varieties. (Samples produced).

By Mr. Cochrane:

Q. Taking them all round, is there any better variety than Red Fife?

A. I think not, for those districts where Red Fife can be harvested every season in good condition. The object of introducing these other wheats is not to displace Red Fife, but to fill the gaps where Red Fife cannot be successfully grown. I hope, some day to produce a variety superior to Red Fife for milling purposes; but at present its only equal appears to be White Fife.

By Mr. Blain:

Q. How would the wheat that is being grown up in the Peace river district succeed in the province of Ontario?

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A. The variety they are growing there is Ladoga. The samples of Ladoga flour and bread which I have here were made from Ladoga wheat grown in Ontario. It is a good wheat, gives good flour, and bread, but the flour is yellowish in colour and not equal to Red Fife for strength. But Ladoga is superior to some of the varieties that are regularly grown in Ontario and Quebec.

By Mr. Cochrane:

Q. Are any of your crosses more prolific than Red Fife?

A. Yes, some of them give larger yields than Red Fife in some localities; but a great deal depends on the soil and climate in which they are grown.

Q. Before you leave this subject, will you tell us what your conclusions are from the experiments in baking bread from the different varieties of wheat?

A. The conclusions can scarcely be expressed in general terms, except that varieties differ very much in the baking value of the flour made from them, and that it is not possible always to distinguish good wheat from poor wheat by the appearance alone. The work of testing the varieties is not yet very far advanced, but I hope, in the course of time, to publish a bulletin on the subject, in which full information will be given as to the value of all the common varieties of wheat for milling and baking purposes. I wish to call your attention to two new varieties of considerable interest on account of their earliness. The first has been named 'Bishop.' It is a cross between Ladoga and a very early wheat obtained from India. It is beardless, has rather a short head, and the kernels are yellow, looking somewhat like White Fife. It is very early in ripening, and we hope that it may prove of value in some of the higher altitudes in the Northwest. The earliest wheat we have has been named 'Aurora.' (Specimen shown). It was obtained by selection from a mixture of wheats from India. It ripened this year at Ottawa on July 26, having been sown on April 23. Of course it would not ripen on July 26 in northern districts, but I mention the date to show how extraordinarily early the variety is. It matures in about the same number of days as six-row barley. It is of very fair quality and I hope by using it as a parent (particularly by crossing it with Red Fife), to obtain a variety of really excellent quality that will ripen extremely early. Red Fife this past season ripened on August 9, having been sown on the same day as the Aurora. The latter variety was, therefore, two weeks earlier. We have obtained other interesting sorts from India from mixed commercial samples. The Indian wheats are marvellous mixtures. The millers of England are complaining that a large amount of dirt is deliberately added to the wheat for the purpose of giving it weight, and if this is true, it is not surprising that we should find mixtures of eight or ten varieties under one name. No care seems to be taken to keep the wheat true to name, or to any fixed type.

In our work of selection we not only separate out pure varieties from mixtures but we also sometimes select individual plants from fixed varieties when they give indications of special productiveness or other good qualities. For instance, we take such a variety as Red Fife and sow a large number of grains four inches apart each way, so that the individual plants will be clearly seen when growing, and from this plant we select certain plants which by their earliness, or their productiveness, or some other quality, give promise of becoming particularly valuable. This plant then becomes the mother-plant of a new strain of wheat. We are not able to say yet what results will be obtained from this sort of work, but we hope that there may be considerable gain in earliness, and possibly in yield also, by this method of selection. We have now eight new strains of Red Fife which have some superiority in regard to earliness, and have in some cases other characteristics which distinguish them from ordinary Red Fife, although we could not fairly say they are new varieties. Possibly we may obtain in this way an early Red Fife. Such a wheat would be of considerable value.

By Mr. Bland:

Q. What was the name of the wheat which you said was considered to be **rust** proof?

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A. The 'Bobs.' It was supposed to be a cross between wheat and rye.

Q. Do you think it would be a success in Ontario?

A. I have not yet enough information in regard to it to enable me to form an opinion. The wheat was received this winter from the originator of it, in Australia. It was the result of an attempt to cross wheat with rye; but there is considerable doubt as to it being a true cross.

Q. It is not likely to be a very good wheat for flour, I suppose?

A. We have not been able to test it, as the quantity we received was only about a tablespoonful.

By the Hon. Mr. Fisher:

Q. In these samples of wheat of the different grades sent to you by Mr. Horn, did you find a very great admixture of other varieties than Red Fife?

A. There were not very many kernels present which clearly belonged to other varieties.

Q. Were they practically all Red Fife?

A. They nearly all looked like Red Fife, but that type of kernel is common to several varieties, so that an accurate separation by the eye alone, is not possible. It is only in cases where there are marked differences in the shape of the kernels or in the colour of the skin that one can separate out other varieties from those of the Red Fife type. I have no doubt that these samples received from Mr. Horn consist chiefly of Red Fife. We intend, however, to sow, next spring, samples from these different lots (as far down in the list as there is any probability of them germinating) and in that way we expect to determine with fair accuracy the percentage of Red Fife that each contains. This will be done by inspecting and counting the heads produced; as the heads give a better chance of making separations than the kernels alone.

Q. Do you think there has been any serious cross-fertilization of the Red Fife with other wheats in the fields and that mixtures of other varieties with Red Fife may have been produced in this way?

A. I believe that such cross-fertilization undoubtedly occurs when mixed wheats are sown; but I do not think it happens often enough to be a matter of very great importance as affecting the purity of seed grain. At the same time the occasional production of accidental crosses needs to be considered when efforts are being made to secure seed of any variety in a condition of absolute purity.

By Mr. Cash:

Q. Were these samples of the different grades of wheat to which you have referred taken from shipments from the Northwest Territories, or from Manitoba?

A. From both.

Q. The reason I ask is that if the grain was grown on land that had timber on it, such as our poplar, it would be soft; but the same wheat grown on ordinary prairie land would produce grain of a darker colour?

A. As I have already explained, the samples we received were made up from many different shipments of wheat, so that no doubt all the common kinds of soil are represented. I hope to obtain next season some samples of soft wheat grown on the kind of land you referred to, in order to test their value, as compared with hard wheat, for milling purposes.

By Mr. Jackson (Selkirk):

Q. I understood you to say you cannot pick Red Fife from Club wheat. How can a farmer pick it out?

A. I expect him to pick it out in the field. The heads of Club wheat are very different from those of Red Fife, though the kernels of both varieties look much alike.

Q. How about the man who is buying grain?

A. As a rule he can tell very little about its purity. An absolutely pure sample of Club wheat could be identified, but mixtures of kernels are extremely difficult to

deal with. It is usually possible, however, to determine varieties by the kernels alone if one is quite certain that the sample is one variety only.

Q. You can easily tell Ladoga from Red Fife?

A. If they are pure it is not a difficult matter to distinguish them, but it would be impossible to pick out, for instance, ten per cent of Ladoga kernels associated with 90 per cent of Red Fife.

By Mr. Schaffner:

Q. Where was that red Club wheat grown, on the open prairie or on land that was burnt off?

A. I do not know the character of the land on which it was grown.

Q. On the Turtle Mountain the timber has been burnt off, and the farms growing wheat a mile or so away grow hard wheat, but where the timber has been burnt off the wheat is soft.

THE CHAIRMAN.—That is true of scrub land as well.

By Mr. Lewis:

Q. Is there any difference in commercial value between this Club wheat and Red Fife?

A. Probably not, if the buyer does not know what variety he is buying. I do not think that buyers distinguish varieties as a rule; most of the wheat in commerce is very much mixed, and buyers therefore seldom see any variety in pure condition. If one wished to sell a shipment of Club wheat to a company having an experimental flour mill, such as some of the large milling companies have, it would be a different matter. The inferior character of the wheat would be detected at once in the laboratory, and it might not then be saleable at any price for flour-making.

By Mr. Jackson (Selkirk):

Q. Have you made any test as to the value of wheat that has been kept dry, as compared with wheat that has been left in the field and become reduced in grade to No. 1 Northern or No. 2 Northern?

A. No, sir.

Q. That would be interesting, to know the difference in value between wheat that has been stooked and wheat that has got wet. If we keep our wheat so as not to let the rain on it, what would be the gain as compared with wheat that had been wet?

A. It is not probable that there would be any great loss in actual value.

Q. The buyers put it down?

A. Of course they judge the value of the grain by its appearance, not by a milling test.

By Senator Young:

Q. You do not take the position that exposing the wheat to wet is not injurious?

A. No, sir; but I am inclined to think that when only the surface of the berry has been injured the value of the grain for milling purposes has not been seriously lowered. It appears also, from the rather soft Red Fife grown in Ontario and hard Red Fife grown on the western prairies, that the milling value of the softer wheat is higher than is generally believed. It does not appear that the harder wheat necessarily makes better flour. In some cases it does not make as good flour as the softer wheat. But I presume that hard wheat will always give less break flour and a higher percentage of patent flour than soft wheat. This fact, however, does not prove any inferiority in the quality of the patent flour made from the soft wheat. The best flour I have yet analyzed and baked was made from Red Fife wheat, grown at Ottawa in the year 1902.

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By Mr. Lewis:

Q. How would that sample of wheat grade?

A. The sample I am alluding to would grade rather low, according to the western standards, on account of containing a large number of soft kernels. It would perhaps grade as No. 2 Northern or No. 3 Northern, but it makes better flour than No. 1 hard grown at Indian Head this past season. This superiority is, however, perhaps due partly to age.

By Mr. Jackson (Selkirk):

Q. What does our hard red wheat lack that we cannot make common soda biscuits from it?

A. The gluten in it is too tough, thus rendering it unsuited not only for soda biscuits, but also for pies, for tea biscuits, and for many kinds of cake as well. For such purposes a weaker flour is required. This can be made from most varieties of winter wheat, and from some sorts of spring wheat, such as White Russian, for instance. The very quality that makes a wheat good for the production of light, elastic dough makes it unsuitable for the preparation of biscuits, cakes and pastry, which ought to be flaky or friable when properly made.

Q. A gentleman in Winnipeg recently imported a large quantity of flour from St. Louis for pastry purposes.

A. I have heard of other similar instances. The so-called pastry flour sold in Canada is very often practically identical with the flour sold for bread-making, which accounts for the fact that Canadian pies are not always as easy to digest as they should be. The flour is too strong.

By Mr. McKenzie (Bruce):

Q. Is it invariably the case that our wheat from scrub land is softer?

The CHAIRMAN.—Yes, it grades Northern instead of Hard.

REPORTS FROM THE PEACE RIVER DISTRICT.

The last time I appeared before this Committee I mentioned that we had sent up to the Peace river district some samples of early maturing cereals, to some farmers there whose addresses had been obtained by Mr. James Macoun, when he was in that country. I have a few replies from them, which I think perhaps may be interesting to lay before the Committee in order to give you some hints as to the possibilities of grain growing in that district. The reports received are from Peace River Landing, in latitude $56\frac{1}{2}^{\circ}$, and from Spirit river, in latitude $55\frac{2}{3}^{\circ}$. I shall also refer to another which is not in the Peace river district, but from Keewatin district in latitude $53\frac{1}{2}^{\circ}$. The samples that I have here are from Mr. Allan Brick of Peace River Landing. There are three samples of wheat and one of oats. They are all very good. From Spirit river Mr. Charles Bremner writes, 'The barley produced good samples,' (it was the Odessa barley which we sent to him), 'also the oats' (Tartar King, one of our earliest varieties, but not good for milling), 'but the wheat was badly frozen in July and August.' He also mentions that the season was very dry. The Spirit river district, as you may remember, lies rather far to the southwest, in the Peace river country.

By Senator Young:

Q. Towards the foothills?

A. Yes.

By Mr. Jackson (Selkirk):

Q. How far from where the last samples were grown?

A. About fifty miles south-west, but the elevation is higher there. The elevation increases as one goes south-west, that being up the river.

Q. What proof have you that those samples were grown there?

A. We have no guarantee as a rule in such cases, except the word of the sender of them. But that is accepted as sufficient. We know that good wheat is grown at certain points considerably north of Peace River Landing. But, of course, these are early varieties. Red Fife would not succeed up there as a rule.

The Rev. Father Josse, of Spirit river, writes, 'The samples you sent us have succeeded very well. Both the wheats ripened all right. However, Gehun wheat (a very early variety from India) was ripe earlier than Stanley wheat, and therefore has more chance to succeed in this country. Odessa barley and Flying Scotchman oats have succeeded perfectly well. This year was a pretty dry one. The straw of Gehun wheat was short.'

The Rev. Robert Simpson, also of Spirit river, writes: 'The season was against us. We sowed on April 27 and all were ripe by August 25. The Preston wheat and Tartar King oats yielded heavily. Of course the straw was shorter than it would have been had we had rain.'

By Mr. Mackenzie (Bruce):

Q. Was that grain grown on the prairie or in the river valley?

A. In the valley, I presume.

The Rev. J. H. Lowes, of Island Lake, Keewatin, in latitude $53\frac{1}{2}^{\circ}$, which is about the same as that at Edmonton, but in an unsettled and little known district, writes that he obtained a good yield from Early Riga wheat sown on May 2 and cut August 29, and from Welcome oats sown on May 16 and cut on September 5.

By Mr. Jackson:

Q. I know that gentleman, and I know that he is reliable. I met him about two years ago. He is about 150 miles north-east of Lake Winnipeg, between Lake Winnipeg and Hudson Bay, perhaps 350 to 400 miles north of Winnipeg, almost directly north, because Lake Winnipeg bends to the west. But that section of country is too rocky for the growing of wheat on a large scale.

By an Hon. Member:

Q. With regard to this Peace river wheat, do you know the date it was sown and the date it was harvested?

A. I do not know.

Q. Would it not be a good thing to have all that information?

A. It would certainly be desirable, but the difficulty of carrying on correspondence with that part of the country is very great. One of the farmers to whom we sent samples on the 15th of November, 1903, we did not hear from until about January, 1905, and then his letter informed us that the grain had not reached him in time to be sown in the spring of 1904, but that he hoped to sow it in 1905. We hope to receive a report on this grain next winter.

NEW VARIETIES OF OATS AND BARLEY.

That is all I wish to bring before the committee to-day in regard to wheat. I have some matter in connection with new varieties of oats and barley. While the problems in connection with wheat growing seem to be the most important just now and deserving of particular attention, we are also making efforts to cope with some of the questions which arise in regard to oats and barley as well. We have obtained within the last year some new varieties of considerable interest among which one of the most promising is the 'Swedish Ligowo' oat which, judging from one season, seems to be superior to the ordinary Improved Ligowo which we have been growing in the past.

By Senator Young :

Q. Is it a white oat?

A. Yes, it is practically identical with Ligowo, but we obtained last season a

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heavier yield and it ripened quite as early. Whether this was due to the superiority of the seed, we could not determine in one season. As a rule when we obtain seed oats or barley from Europe, we receive remarkably plump grain, and this may account, in some cases, for the fact that these new varieties often stand very high in our list for the first season. We obtained also from Sweden a very early yellow oat under the name of Gold Rain, which we hope may be of use in the far north. Another white oat was obtained under the name of Abundance, from Garton Bros., well-known seedsmen in northern England. This seems likely to be productive. In barley we obtained five very interesting samples of extremely plump grain from Sweden under the names of Princess, Primus, Swedish Chevalier, Hannchen and Swan's Neck. These all succeeded well at the Central Experimental Farm last season. We have also, for the coming season, a sample of Chevalier barley of the Archer strain. The Archer Chevalier is regarded by the brewers in Ireland as being one of the best varieties for their purposes.

By Hon. Mr. Fisher :

Q. That is a two-row barley?

A. Yes. For malting purposes two-row barley is used in Ireland almost exclusively, plump, starchy kernels being most in demand.

By Mr. Jackson (Selkirk) :

Q. Do they consider colour?

A. No doubt they do, for the production of light-coloured ales; but in breweries where only dark-coloured products are made the colour of the barley is not regarded as of much importance. This variety (Archer Chevalier) we shall sow on the Central Farm this season, and we look forward with some interest to seeing whether it will prove superior to the other strains of Chevalier.

By Mr. Christie :

Q. In Ontario we want the variety that will yield the most, as we use the barley for feed?

A. In Ontario the six-row varieties are usually grown, probably because of their earliness in ripening.

Q. Which do you consider the best two-row barley?

A. The French Chevalier and the Canadian Thorpe are perhaps the best.

By Senator Young :

Q. It depends somewhat on the soil?

A. Undoubtedly. Among six-row barleys we have found the Odessa and the Mensury to be about the best. I think that is all the matter, Gentlemen, which I wish to bring before you this morning, unless you have any further questions to ask.

GOLDEN DROP WHEAT.

• *By Mr. Jackson (Selkirk) :*

Q. We had Golden Drop wheat in Winnipeg 25 years ago. Have you tested that variety?

A. It was tested on the experimental farms for several years, but was discontinued in 1899 on account of its small yield.

EMMER AND SPELT.

By Mr. Miller :

Q. I have seen in a recent issue of the Farmer's 'Advocate' letters from people who say they have grown a western grain called Emmer with very great profit. Do you know anything of that?

A. Yes, we have been growing several varieties of Emmer for some years,, and we published a bulletin on 'Emmer and Spelt' last June. Emmer is a grain that may be considered as a variety of wheat. It is commonly known in America under the name of 'Speltz,' but true Spelt is different from Emmer, although they are very much alike. In both the husk holds the kernel so closely that in threshing it does not come out. These cereals are useful for fodder purposes when the whole material (grain and husk) is ground up. They resist rust perhaps better than any variety of true wheat. The straw, therefore, is sometimes used for feeding purposes, but unless the crop is cut very early the strong awns of the Emmer are apt to give trouble.

Q. A few years ago a firm of Toronto seedsmen were advertising 'Speltz' as a very profitable grain. It was maintained by some people that a great difference existed between Emmer and Speltz, in favour of Emmer. Was the grain advertised as 'Speltz' by the seedsmen identical with what you call Emmer?

A. Yes, there is only one variety grown in Canada, outside of experiment station work, and that is the common form of Emmer, incorrectly called 'Speltz.' 'Speltz' is a corruption of a German word, and should not be used. The English word is Spelt; but as I have already stated, the common variety of Emmer is quite distinct from true Spelt.

Q. Have you found it to be a profitable all round crop?

A. It seems to be a desirable grain for certain districts, but our experiments, as far as they have gone, indicate that in most districts in Canada the Emmer is not equal to the best varieties of oats or barley. On the experimental farm at Brandon, however, Emmer has done particularly well, and it is probable that in other districts it would be found of considerable value. It is said to resist drought very well.

By Mr. Cash:

Q. We have a number of Russian Germans in my district who grow it, and consider it quite valuable.

DUCK-BILL BARLEY.

By Mr. Christie:

Q. Do you consider Duck-Bill two-rowed barley equal to those that you named?

A. We have not considered it quite equal in yield, and are not paying so much attention to it on that account. The Canadian Thorpe resembles the Duck-Bill and gives, with us, a larger yield. The French Chevalier, which I mentioned before, is also very productive.

Q. Are they all of stiff straw?

A. Fairly stiff. Of course the Chevalier has such a long head that it always bends over somewhat.

Q. The Duck-Bill has a stiff straw, and on heavy land it hardly ever goes down.

PEACE-RIVER WHEAT.

By Mr. Lewis:

Q. Would the country around Peace River Landing be good for wheat growing?

A. I believe that portions of the country in the river valley are good.

Q. How would those samples of wheat from Mr. Brick grade?

A. I should think they would be—

Q. Is the grain that is being grown around Edmonton similar to these samples?

A. I have not seen enough of Edmonton wheat to be able to answer that question.

Q. How far north of Edmonton does Mr. Brick live?

A. About 250 miles north-west.

Having read the preceding transcript of my evidence, I find it correct.

CHAS. E. SAUNDERS,
Experimentalist, Central Experimental Farm.

